AMENDMENTS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1.   **(Currently Amended)** An apparatus for correcting relative positional relationship between an actual video image captured by a camera and a virtual video image for use in a video image display device for superimposing the actual video image and the virtual video image on a monitor screen, the actual video image and the virtual video image having a X-axis and a Y-axis, comprising:

actual targets set in an actual coordinate system in an area captured by the camera;

coordinate conversion means for theoretically deriving monitor coordinates in a monitor coordinate system on the monitor screen by coordinate conversion of actual coordinates of the actual targets in the actual coordinate system based on reference values of coordinate conversion parameters including internal parameters of the camera itself, attachment parameters for attaching the camera to the vehicle and conversion constants to the monitor screen, wherein the conversion constants are a X-axis magnification, a positional deviation in the X-axis direction, a Y-axis magnification, and a positional deviation in the Y-axis direction;

recognition means for recognizing the monitor coordinates of the image of the actual targets actually captured by the camera; and

correction means for correcting at least values of the internal parameters of the camera itself of the coordinate conversion parameters based on deviations between the monitor coordinates of the image of the actual targets actually captured by the camera and the corresponding monitor coordinates in the monitor coordinate system of the actual targets which has been subjected to the coordinate conversion, and correcting relative positional relationship

between the actual video image and the virtual video image based on the corrected values of the coordinate conversion parameters,

the correction means generating relational expressions the number of which is larger than the number of the coordinate conversion parameters based on the monitor coordinates of the image of the actual targets, the monitor coordinates in the monitor coordinate system of the actual targets which have been subjected to coordinate conversion and the deviations between the monitor coordinates of the image of the actual targets and the monitor coordinates in the monitor coordinate system of the actual targets which have been subjected to coordinate conversion, the coordinate conversion parameters being corrected such that the square-sum of the deviations is the minimum;

the number of actual targets being determined such that the number of the relational expressions is larger than the number of the coordinate conversion parameters which require correction,

the recognition means providing a virtual target in the monitor coordinate system on the monitor screen based on the coordinate conversion parameters before modification using the coordinate conversion means, and carrying out the recognition based on the difference between the monitor coordinate of the image of the actual target captured actually by the camera and the monitor coordinate of the virtual target.

2.   (Canceled)

3.   (Previously Presented) A video image positional relationship correction apparatus according to claim 1, wherein the recognition means includes a controller for moving one of the actual target and the virtual target on the monitor screen to a position overlapped on the other of the actual target and the virtual target by manipulation of an operator.

4.   (Original) A video image positional relationship correction apparatus according to claim

3, wherein the controller includes direction buttons for inputting a correction amount of one of

the actual target and the virtual target on the monitor screen in an up direction, a down direction,

a left direction and a right direction, a decision button for confirming a condition in which the

actual target and the virtual target are overlapped with each other, and a calculation button for

allowing the correction means to start correction calculation.

5.   (Original) A video image positional relationship correction apparatus according to claim

1, wherein the recognition means includes an image processing circuit for carrying out the

recognition by image processing.

6.   (Original) A steering assist apparatus having a video image positional relationship

correction apparatus according to claim 1, wherein the actual video image and the virtual video

image are a video image at the back of the vehicle and a steering assist guide, respectively.

7.   (Original) A steering assist apparatus according to claim 6, wherein the actual target is

set on a road surface.

8.   (Original) A steering assist apparatus according to claim 6, wherein the actual target is

set on a planar member attached to a rear portion of the vehicle.

9.   (Currently Amended) A method of correcting relative positional relationship between

an actual video image captured by a camera and a virtual video image when superimposing the

actual image and the virtual video image on a monitor screen, the actual video image and the

virtual video image having a X-axis and a Y-axis, comprising the steps of:

capturing actual targets in an actual coordinate system by the camera;

theoretically deriving monitor coordinates in a monitor coordinate system on the monitor screen by coordinate conversion of actual coordinates of the actual targets in the actual coordinate system based on reference values of coordinate conversion parameters including internal parameters of the camera itself, attachment parameters for attaching the camera to the vehicle and conversion constants to the monitor screen, wherein the conversion constants are a X-axis magnification, a positional deviation in the X-axis direction, a Y-axis magnification, and a positional deviation in the Y-axis direction;

providing a virtual target in the monitor coordinate system on the monitor screen based on the coordinate conversion parameters before modification and recognizing the monitor coordinates of the image of the actual targets actually captured by the camera based on the difference between the monitor coordinate of the image of the actual target captured actually by the camera and the corresponding monitor coordinate of the virtual target;

generating relational expressions based on the monitor coordinates of the image of the actual targets, the monitor coordinates in the monitor coordinate system of the actual targets which have been subjected to coordinate conversion and deviations between the monitor coordinates of the image of the actual targets and the monitor coordinates in the monitor coordinate system of the actual targets which have been subjected to coordinate conversion, the number of relational expressions being larger than the number of the coordinate conversion parameters to be corrected including at least internal parameters of the camera itself of the coordinate conversion parameters;

correcting the coordinate conversion parameters such that the square-sum of the deviations is the minimum; and

correcting relative positional relationship between the actual video image and the virtual video image based on the corrected values of the coordinate conversion parameters.

-5-

10. **(Canceled)**

11. **(Previously Presented)** A method for the video image positional relationship correction according to claim 9, wherein the difference between the monitor coordinate of the image of the actual target and the corresponding monitor coordinate of the virtual target is calculated by moving one of the actual target and the virtual target to a position overlapped on the other of the actual target and the virtual target on the monitor screen by manipulation of an operator.

12. **(Original)** A method for the video image positional relationship correction according to claim 9, wherein the monitor coordinates of the image of the actual targets are recognized by image processing.

13. **(Previously Presented)** A video image positional relationship correction apparatus according to claim 1, wherein the recognition means automatically recognizes the nearest actual target to the virtual target without displaying the virtual target.

14. **(Previously Presented)** A video image positional relationship correction apparatus according to claim 1, wherein the correction means calculates lines extending between new virtual targets based on the coordinate conversion parameters after modification, the lines being displayed on the monitor screen.

15. **(Previously Presented)** A method for the video image positional relationship correction according to claim 9, wherein the nearest actual target to the virtual target is automatically recognized without displaying the virtual target.

-7-

16. **(Previously Presented)** A method for the video image positional relationship correction according to claim 9, wherein lines extending between new virtual targets are calculated based on the coordinate conversion parameters after modification and displayed on the monitor screen.

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